CLAIMS

WHAT IS CLAIMED IS:

1. A method for deriving an estimate of a wireless channel in a wireless communication system, comprising:

obtaining an intermediate vector derived based on K sub-vectors of a vector for a first channel estimate and at least two discrete Fourier transform (DFT) sub-matrices for a DFT matrix, wherein the DFT matrix corresponds to the vector for the first channel estimate and K is an integer greater than one;

obtaining an intermediate matrix for the DFT matrix; and

deriving a second channel estimate based on the intermediate vector and the intermediate matrix.

2. The method of claim 1, wherein the first channel estimate is a channel frequency response estimate and the second channel estimate is a channel impulse response estimate for the wireless channel.

3. The method of claim 1, wherein the intermediate vector is based on

$$\underline{\mathbf{B}} = \sum_{k=1}^{K} \underline{\mathbf{W}}_k^H \, \underline{\hat{\mathbf{H}}}_k \quad ,$$

where $\underline{\mathbf{B}}$ is the intermediate vector,

$\underline{\mathbf{W}}_k$ is a k-th DFT sub-matrix among K DFT sub-matrices of the DFT matrix,

$\underline{\hat{\mathbf{H}}}_k$ is a k-th sub-vector among the K sub-vectors for the first channel estimate, and

"H" is a conjugate transpose.

4. The method of claim 1, wherein the at least two DFT sub-matrices include K DFT sub-matrices corresponding to the K sub-vectors, and wherein the obtaining the intermediate vector includes

performing a matrix multiply of each of the K sub-vectors with a corresponding one of the K DFT sub-matrices to obtain a corresponding intermediate sub-vector, and

accumulating K intermediate sub-vectors, obtained from the matrix multiply of the K sub-vectors with the K DFT sub-matrices, to obtain the intermediate vector.

5. The method of claim 1, wherein the obtaining the intermediate vector includes

computing discrete Fourier transforms of a first matrix, formed based on the vector for the first channel estimate, to provide a second matrix, and

computing inner products between columns of a base DFT sub-matrix and rows of the second matrix to obtain the intermediate vector.

6. The method of claim 5, wherein the DFT of the first matrix is computed using a radix-2 fast Fourier transform.

7. The method of claim 5, wherein the DFT of the first matrix is computed using a radix-4 fast Fourier transform.

8. The method of claim 1, wherein the intermediate matrix is based on

$$\underline{\mathbf{A}} = \left(\sum_{k=1}^{K} \underline{\mathbf{W}}_k^H \underline{\mathbf{W}}_k \right)^{-1} ,$$

where $\underline{\mathbf{A}}$ is the intermediate matrix,

$\underline{\mathbf{W}}_k$ is a k-th DFT sub-matrix among K DFT sub-matrices of the DFT matrix, and

" H " is a conjugate transpose.

9. The method of claim 1, wherein the intermediate matrix is pre-computed.

10. The method of claim 1, wherein the second channel estimate is a least square estimate based on the first channel estimate, and wherein the intermediate vector and the intermediate matrix are two parts of the least square estimate.

11. The method of claim 2, further comprising:

deriving an enhanced channel frequency response estimate based on the channel impulse response estimate.

12. The method of claim 11, wherein the channel frequency response estimate covers a first group of subbands and the enhanced channel frequency response estimate covers a second group of subbands.

13. The method of claim 12, wherein the first group includes a subset of the subbands in the second group.

14. The method of claim 1, wherein the wireless communication system is an orthogonal frequency division multiplexing (OFDM) communication system.

15. A method for deriving a channel estimate in a wireless communication system, comprising:

obtaining an intermediate vector derived based on K sub-vectors of a vector for a first channel estimate and K discrete Fourier transform (DFT) sub-matrices of a DFT matrix, where K is an integer greater than one;

obtaining an intermediate matrix derived based on the K DFT sub-matrices; and

deriving a second channel estimate based on the intermediate vector and the intermediate matrix.

16. A method for deriving an estimate of a wireless channel in an orthogonal frequency division multiplexing (OFDM) communication system, comprising

forming a first matrix for an initial frequency response estimate of the wireless channel;

computing discrete Fourier transforms (DFTs) of the first matrix to obtain a second matrix;

computing inner products between a base DFT sub-matrix and the second matrix to obtain an intermediate vector;

obtaining an intermediate matrix derived for a DFT matrix for the initial frequency response estimate; and

deriving a channel impulse response estimate based on the intermediate vector and the intermediate matrix.

17. The method of claim 16, further comprising:

deriving an enhanced frequency response estimate for the wireless channel based on the channel impulse response estimate.

18. A memory communicatively coupled to a digital signal processing device (DSPD) capable of interpreting digital information to:

obtain an intermediate vector derived based on K sub-vectors of a vector for a first channel estimate and at least two discrete Fourier transform (DFT) sub-matrices for a DFT matrix, wherein the DFT matrix corresponds to the vector for the first channel estimate and K is an integer greater than one;

obtain an intermediate matrix for the DFT matrix; and

derive a second channel estimate based on the intermediate vector and the intermediate matrix.

19. An apparatus operable to derive an estimate of a wireless channel, comprising

means for obtaining an intermediate vector derived based on K sub-vectors of a vector for a first channel estimate and at least two discrete Fourier transform (DFT) sub-matrices for a DFT matrix, wherein the DFT matrix corresponds to the vector for the first channel estimate and K is an integer greater than one;

means for obtaining an intermediate matrix for the DFT matrix; and

means for deriving a second channel estimate based on the intermediate vector and the intermediate matrix

20. The apparatus of claim 19, wherein the means for obtaining the intermediate vector includes

means for computing a DFT of a first matrix, formed based on the vector for the first channel estimate, to provide a second matrix, and

means for computing inner products between columns of a base DFT sub-matrix and rows of the second matrix to obtain the intermediate vector.

21. The apparatus of claim 19, wherein the wherein the first channel estimate is a channel frequency response estimate and the second channel estimate is a least square channel impulse response estimate for the wireless channel.

22. A device in a wireless communication system, comprising:

a demodulator operative to receive a pilot transmission on a group of designated subbands; and

a processor operative to

obtain a first channel estimate for the group of designated subbands based on the received pilot transmission,

obtain an intermediate vector derived based on K sub-vectors of a vector for the first channel estimate and at least two discrete Fourier transform (DFT) sub-matrices for a DFT matrix, wherein the DFT matrix corresponds to the vector for the first channel estimate and K is an integer greater than one,

obtain an intermediate matrix for the DFT matrix, and

derive a second channel estimate based on the intermediate vector and the intermediate matrix

23. The device of claim 22, wherein the processor is further operative to

compute discrete Fourier transforms of a first matrix, formed based on the vector for the first channel estimate, to provide a second matrix, and

compute inner products between columns of a base DFT sub-matrix and rows of the second matrix to obtain the intermediate vector.

24. The device of claim 22, wherein the first channel estimate is a channel frequency response estimate and the second channel estimate is a channel impulse response estimate, and wherein the processor is further operative to

derive an enhanced channel frequency response estimate based on the channel impulse response estimate.